

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE SPECIFICATION

## IRRIGATION WATER CONVEYANCE, NONREINFORCED CONCRETE DITCH AND CANAL LINING

(Acre)  
CODE 428A

### 1. SITE PREPARATION

**Clearing.** Remove all vegetative matter such as brush, willows, weeds and roots larger than one-half inch diameter from the foundation area. All large trees with root systems that are a hazard to the ditch or canal lining shall be removed to designated areas.

**Disposal of Unsuitable Material.** Disposal of all unsuitable foundation material shall be by burning, burying, or removal from the site and shall comply with state and local laws.

### 2. EARTHFILL

**Foundation Preparation.** Scarify the subgrade areas to a depth of at least six inches before starting compaction. Where any part of the lining is to be located over an old ditch, remove the ditch banks from the ditch bottom to the top of the bank. This removal shall be to a distance of at least one-foot outside and underneath the proposed lining. The slope shall not be steeper than 1:1 before starting backfill and compaction.

**Fill Material.** All fill shall be free of sod, grass, rocks over 2" and material unsuitable for making compacted fills.

**Moisture Control.** All fill material and subgrade material to a depth of six inches shall have sufficient moisture that a sample taken in the hand and squeezed shall remain intact when released. Add water by sprinkling if the foundation lacks sufficient moisture. Add water to the fill material by irrigation of borrow areas or by sprinkling the material placed in the embankment. Added water will be uniformly mixed into the fill material.

**Compaction.** The area upon which the compacted fill is to be placed shall be free of water, rocks, debris, or other unsuitable material. The foundation shall be compacted before placement of any fill material. Loaded construction equipment, or approved compaction equipment, shall be so routed that the entire surface area of each lift is traversed by not less than two passes of the compaction equipment before placing fill material for the next lift.

**Placement of Fill Material.** Fill material shall be placed in lifts not exceeding six inches before compaction. Spread the material in a direction parallel to the centerline of the ditch or canal uniformly over the full width of the embankment.

**Excavation for Placement of Lining.** Excavate to the neat lines of the specified cross-section. Ripping shall be confined to the cross-section for the ditch. The surface of the finished earth section shall be smooth and well compacted. Backfill any over-excavated areas with moist soil and compact to a density greater than or equal to adjacent undisturbed material.

**Finishing the Earthwork.** After the concrete lining and structures have been finished, place any compact fill materials needed to complete the banks and berms. The area shall present a smooth, professional appearance when completed.

### 3. MATERIALS

**Cement.** The cement shall be Portland cement, Type II, IIA, or V, as specified for the job. If Type II or Type V cement is used, an air-entraining agent (ASMT C-260) shall be added to the mixing water in the amount needed to produce an air

content from four to seven percent in the concrete mixture.

**Water.** Use clean water, free from acid, alkali, oil, or organic impurities, for mixing concrete. Water suitable for drinking is generally good for mixing concrete.

**Aggregates.** Aggregates shall be well-graded in size, clean, dry, hard, durable, uncoated particles free from lumps of clay, soft or flaky particles, loam, caliche, organic matter or other harmful material and conform to ASTM C-33. The maximum size of aggregate shall not exceed one-half the specified lining thickness.

**Concrete Mix.** Concrete used in ditch and canal lining shall be so proportioned that it is plastic enough for thorough consolidation and stiff enough to stay in place on the side slopes. A dense durable product will be required.

All concrete shall be proportioned, mixed, placed and cured as required to produce a 28-day strength of at least 2,500 pounds per square inch.

Concrete made with water and aggregates specified above and containing a minimum of 5.5 sacks of the specified type of cement per cubic yard will be accepted as meeting the proportioning requirement.

When used, ready mixed concrete shall be mixed and delivered in conformance with ASTM Designation C-94 and shall conform to the above requirements for cement type and maximum aggregate size. The concrete shall be discharged from the mixer within 1.5 hours after adding the mixing water to the cement and aggregates, or cement to aggregates. Reduce this time to 0.75 hour when the concrete temperature exceeds 85 degrees F.

**Admixtures.** Admixtures used as accelerators or antifreeze compounds will not be allowed.

**Concrete Placement.** The concrete lining shall be placed on moist, compacted surfaces free of debris, loose soil, mud or

water. If the foundation soils are not adequately moist, moisten them by sprinkling immediately before placing the concrete.

Concrete shall not be placed against frozen surfaces.

Construction of concrete lining will not be permitted when minimum 24 hour temperatures are expected to drop below 32 degrees F unless the method of applying artificial heat to the lining has prior approval of the engineer.

**Protection from Freezing.** Concrete shall not be placed during freezing weather unless adequate protection is provided to keep the concrete temperature between 50 and 90 degrees F for a period of not less than seven (7) days.

**Contraction or Construction Joints.** All concrete ditch or canal lining shall have either (a) scored false contraction joints, or (b) construction or contraction joints installed in accordance with the following:

Scored false contraction joints shall be installed in fresh, mechanically placed concrete and shall not be less than one-fourth inch wide. They shall have a depth of not less than one-third the lining thickness. They shall be installed on a uniform spacing not to exceed 10.0 feet.

All construction joints shall be butt type, formed square with the lining surface, and at right angles to the ditch or canal.

Formed concrete and concrete hand-place with templates shall be placed in alternate sections not exceeding a length of 10.0 feet per section. Intermediate sections shall then be placed after the first sections have set.

**Finishing.** All concrete shall have a float finish or its equivalent and shall be free of honeycombed or sand-streaked areas.

**Curing.** A concrete curing compound shall be applied to the concrete surface within 20 minutes after placing and finishing of the concrete. When white curing compound is used, it shall conform to ASTM C 309, Type 2, Class A or B.

Clear curing compound with fugitive dye (Type 1-D) may be used also.

The compound shall be thoroughly mixed before application and continuously agitated during application.

The application shall be evenly applied. At least 1.0 gallon of curing compound must be applied per 175 square feet of surface area. Two applications may be required in order to achieve the required application rate and consistency.

## **5. CONSTRUCTION TOLERANCE**

Concrete ditch lining and appurtenant structures shall be installed to design lines, grades, and elevations within the following tolerances:

**Vertical.** When the design freeboard is between 6.0 inches and 3.0 inches, the maximum variation in elevation of both the top edge and the bottom of the installed ditch at corresponding points shall be 0.10 foot above or below design grade.

When the design freeboard is greater than 6.0 inches, the tolerance shall be 0.2 foot.

**Thickness.** The thickness must be at least the minimum specified and can be up to 1/2 inch more than what is specified.

**Sectional Width.** Width dimensions shall be within five percent of that specified.